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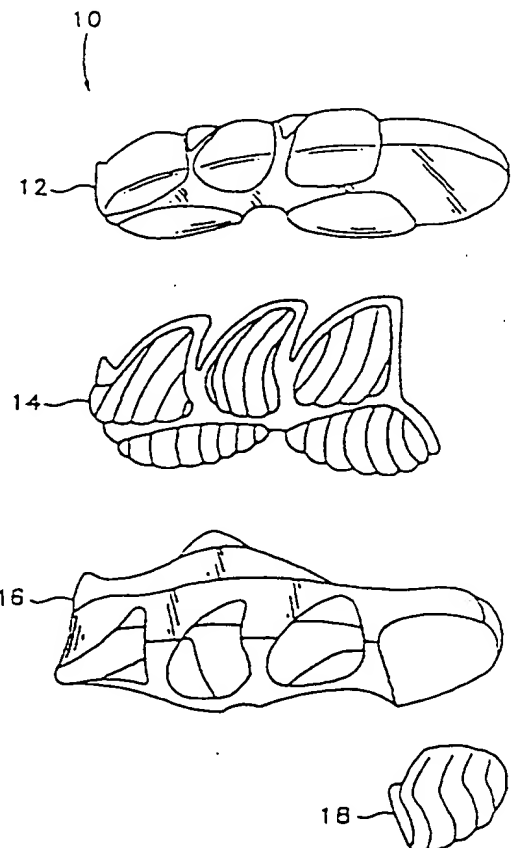
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(54) Title: SHOE HAVING PERFORATED SHOE UPPER WITH OUTWARDLY PROTRUDING OUTSOLE AND METHOD OF MAKING THE SAME

(57) Abstract

The method of constructing the shoe includes forming a shoe upper (16), wherein the upper includes a plurality of openings on the bottom side thereof and an interior foot-shaped cavity. Next, a shoe outsole (14) is inserted into the interior cavity so that portions of the outsole stick out of the openings in the upper and form an exterior contact surface of the shoe. The number and size of the openings in the upper correspond to the number and size of the extruding portions of the outsole, which are placed at strategic locations along the medial and lateral sides of the outsole to provide support for the foot under load bearing conditions. The outsole is attached to the upper by an adhesive and/or stitching. A midsole (12) is then inserted into the cavity and attached to the outsole. A last is inserted into the cavity to apply pressure to the midsole to improve the bonding between the outsole and the midsole. A toe piece (18) made of similar material to the outsole is then attached to a toe portion of the upper to complete the sole.



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SHOE HAVING PERFORATED SHOE UPPER WITH OUTWARDLY PROTRUDING OUTSOLE AND METHOD OF MAKING THE SAME

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BACKGROUND OF THE INVENTION

This invention relates generally to shoe construction and more particularly to a new method of constructing a shoe.

The shoe art is one that dates back centuries if not millennia. Over
10 that time several methods of shoe construction have emerged. Although
not an exhaustive list, the predominate modern methods include the
Stroebel method, the board-last method, and the moccasin style of
construction. The Stroebel method, named after its inventor, uses a shoe
upper, typically of leather or synthetic material, that is formed of
15 essentially two pieces. The first is the upper piece that fits around the
top and sides of the foot. The second is a bottom piece that is in the shape
of an outline of a sole. The two pieces are then sewn together with a
stitch running around the circumference of the bottom piece. A midsole
sole is then attached to the underside of the bottom piece by either an
20 adhesive cement or further stitching, or both. A last is inserted into the
upper to allow the upper to be pressed against the midsole. As is known
in the art, the midsole is made of a flexible, resilient material such as
ethyl vinyl acetate (EVA) in order to cushion the foot. A durable outsole,
typically made of rubber, is then attached to the midsole to provide
25 traction and durability to the sole.

The board-last method replaces the bottom piece of the upper in the
Stroebel method with a board having a similar shape to the bottom piece,
i.e., the outline of a foot. The upper piece of the shoe upper is then
stretched over a last and around the perimeter of the board and attached
30 to an underside of the board by tacks or adhesive. The midsole and

outsole are then attached to the board in a similar manner as in the Stroebel method. A foam sock liner can be inserted in the shoe to provide additional cushion. The advantage of the board-last approach over the Stroebel method is that the board provides greater foot support than the flexible upper material, which is especially important for athletic shoes for high impact sports such as basketball as well as for work boots such as described in U.S. Patent No. 3,913,160 issued to Funck. It is more expensive than the Stroebel method, however, as a result of the cost of the board and the manufacturing cost.

10 The third method is the one used to construct so-called moccasins. The uppers in this method are also usually formed of two pieces. The first is referred to as a moccasin body or plug, which surrounds the foot, and the second is referred to as a vamp, which covers the front of the foot and forms the tongue of the shoe, if there is one. The body or plug is a single piece that includes a heel cup at one end conformed to receive a heel and a toe cup at the opposite end for the toes. A last is then inserted into the foot-shaped cavity formed by the plug, the vamp is stretched progressively over the last and attached to the plug by means of a hand-formed moccasin seam, e.g., a two-thread through-and-through seam.

15 Alternative means can be used for attaching the vamp to the plug as described in U.S. Patent No. 4,023,283 issued to Pfander. An optional outsole and/or midsole can then be affixed to a bottom side of the plug by the methods described above. The moccasins can and are worn without an outsole, e.g., slippers. A sock-liner or other cushioning material such as fur can be attached to the inside of the plug to provide some cushioning for the foot in those cases where a midsole is not used. The moccasin style of construction, in general, provides for a more comfortable shoe than the other two methods because the plug can be conformed to the contour of the foot by the last as described in U.S. Patent No. U.S. Patent

20 No. 4,481,725 issued to Bergmans.

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A hybrid approach is shown in FIG. 27, which is used to make so-called driving shoes. In this method, a plurality of rubber "nubs" are affixed to a bottom side of a moccasin. The bottom side of shoe 100 is shown in an exploded view in FIG. 27 to better illustrate the method of constructing this shoe. The method uses a conventional moccasin 102 having a heel surface 104, which is a part of the bottom side of the moccasin 102. A rubber layer 106 that includes a plurality of nubs protruding away from the layer is attached to the heel surface by a leather piece 110. The nubs (e.g., nub 108) are aligned with corresponding holes (e.g., hole 112) on the piece 110 so that each nub pushes through and extends beyond the corresponding hole. The leather piece 110 is then affixed to the shoe 102 by stitching around the perimeter of the piece. A plurality of nubs are affixed to the forefoot portion of the shoe in a similar manner by either a separate piece of leather 116 or by making piece 110 extend the length of the shoe. Constructed in this way, the nubs become the ground-engaging surface of the shoe and act to massage the foot.

One problem with the Stroebel and board-last methods is that the cushioning layer is separated from the foot by either the upper in the former case or the board in the latter. Adidas, the assignee of the present application, has designed and manufactured a tennis shoe, the TS96™, where the midsole is inserted into the upper so as to place the midsole in closer proximity to the foot. The outsole in that shoe is then affixed directly to the bottom side of the upper. This produces greater comfort than the conventional approaches. The present invention builds on that concept of putting the cushioning element close to the foot to provide added comfort. The new shoe and method of constructing the same described hereinafter, however, takes a radical new approach to the design of shoes not previously found in the prior art.

SUMMARY OF THE INVENTION

The invention comprises a moccasin-type shoe and method of constructing the same. The shoe includes four main components: a moccasin-style shoe upper, an outsole, a midsole, and a toe piece. Unlike
5 prior art shoes, both the outsole and the midsole are inserted into the upper, with the outsole being inserted first and attached to the upper and the midsole being inserted second and attached to the outsole. The midsole is thus placed in direct contact with the foot to provide maximum comfort.

10 The upper includes a plurality of openings formed along the bottom side thereof. The openings form a web-like attachment surface between the openings to which the outsole is attached. The outsole has a plurality of protrusions or so-called "outriggers," with each outrigger extending through a corresponding opening in the bottom side of the shoe upper.
15 The outriggers then form the contact surface with the ground. As such, the outsole is made of a durable rubber. The outsole is attached to the upper at the attachment surface by means of either an adhesive or stitching, or both.

The inner surface of the outsole, which is attached to the midsole,
20 has a plurality of hollowed-out recesses. Each recess is formed above a corresponding outrigger to reduce the weight of the outsole and provide added flexibility. The midsole is formed of a cushioning material since it provides the comfort and cushion to the foot. The midsole has an outer surface that is conformed to the inner surface of the outsole and thus
25 includes a plurality of midsole protrusions, where each midsole protrusion occupies a respective recess in the outsole. The outer surface of the midsole is held in an abutting relationship with the inner surface of the outsole by an adhesive. The toe piece is then attached to a toe portion of the upper by an adhesive. Alternatively, the toe piece could be another
30 outrigger inserted through an additional opening in the upper, as with

the other outriggers.

The foregoing and other objects, features and advantages of the invention will become more readily apparent from the following detailed description of a preferred embodiment of the invention which proceeds
5 with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of a shoe according to the invention.

FIG. 2 is a plan view of a portion of the shoe upper shown in FIG.

10 1.

FIG. 3A is a side elevational view of a vamp used to construct the upper shown in FIG. 1.

FIG. 3B is a side elevational view of a collar piece used to construct the upper shown in FIG. 1.

15 FIG. 4 is a plan view of a tongue piece for the upper shown in FIG. 1.

FIG. 5 is a perspective view of an assembled shoe upper constructed of the pieces shown in FIGS. 2-4.

20 FIG. 6 is a bottom plan view of the outsole, midsole and toe piece assembly referred collectively herein as the shoe sole.

FIG. 7 is a right-side elevational view of the sole of FIG. 6.

FIG. 8 is a left-side elevational view of the sole of FIG. 6.

FIG. 9 is a top plan view of the sole of FIG. 6.

FIG. 10 is a front elevational view of the sole of FIG. 6

25 FIG. 11 is a rear elevational view of the sole of FIG. 6.

FIG. 12 is a cross-sectional view of the sole taken along lines 12-12 in FIG. 6.

FIG. 13 is a cross-sectional view of the sole taken along lines 13-13 in FIG. 6.

30 FIG. 14 is a cross-sectional view of the sole taken along lines 14-14

in FIG. 6.

FIG. 15 is a cross-sectional view of the sole taken along lines 15-15 in FIG. 6.

FIG. 16 is a cross-sectional view of the sole taken along lines 16-16 in FIG. 6.

FIG. 17 is a cross-sectional view of the sole taken along lines 17-17 in FIG. 6.

FIG. 18 is a cross-sectional view of the sole taken along lines 18-18 in FIG. 6.

FIG. 19 is a perspective view of the midsole of FIG. 16.

FIG. 20 shows the step of inserting the outsole into the interior cavity of the upper.

FIG. 21 shows the outsole received in the interior cavity of the upper.

FIG. 22 shows the step of inserting the midsole into the interior cavity of the upper after the outsole is inserted therein.

FIG. 23 shows the step of inserting a last into the interior shoe cavity.

FIG. 24 shows the step of applying force to the last and/or shoe to securely fasten the midsole to the outsole.

FIG. 25 shows the step of attaching the toe piece to a toe portion of the shoe upper.

FIG. 26 shows the completed shoe according to the invention.

FIG. 27 shows an exploded view of a prior art moccasin style shoe.

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DETAILED DESCRIPTION

FIG. 1 shows an exploded view of a shoe shown generally at 10 according to the invention. The shoe is comprised of four main components: a midsole 12, an outsole 14, an upper 16, and a toe piece 18. The midsole provides the cushion and comfort of the shoe and is therefore

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made of a resilient material such as ethyl vinyl acetate (EVA) or polyurethane. Because the midsole is placed inside the shoe upper, as described further below, the midsole 12 can be constructed of softer material than presently used in the construction of midsoles because the midsole is not exposed to the external environment. The outsole 14 is made of durable rubber, as is known in the art, and provides the contact surface of the shoe to the ground. As a result, the outsole is made of a hard, yet flexible, rubber that can withstand wear and tear and exposure to the external environment. In addition, the outsole provides the necessary traction. The shoe upper 16 is a moccasin-type upper in that it extends all the way around the foot to form a foot-shaped interior cavity. The upper is made of several pieces of material which are joined together by stitches as described further below. The final component is the toe piece 18 which in effect can be considered part of the outsole 14. The toe piece 18 is made of a similar to or identical material to that of the outsole 14 and the surface ornamentation follows the same basic pattern. In the embodiment shown and discussed herein, the toe piece 18 is a separate piece. Alternatively, the toe piece 18 could be formed integrally with the outsole 14.

Referring now to FIGS. 2-5, the construction of the upper will now be described. FIG. 2 is a plan view of a piece of upper material 20 that is used to construct a portion of the upper that receives the outsole. The piece 20 includes a plurality of openings for receiving the protrusions or "outriggers", as they are referred to herein, of the outsole. On a lateral side of the shoe are three openings 22, 24 and 26. The shape of each opening is defined by the outline of the corresponding outrigger at its base. On a medial side, there are two larger, more oval-shaped openings 28 and 30. These openings, like those on the lateral side, receive the two outriggers on the medial side of the outsole. The number and shape of these openings is not limited to those shown in FIG. 2. Preferably the

openings are as shown in FIG. 2 because of the design and placement of the outriggers, which are placed at certain strategic points on the sole to provide lateral support during extreme side-ways motion while load-bearing as described further below. Alternatively, the openings can be
5 formed on different places on the piece, however, the outsole would need to be modified accordingly. One such alternate embodiment has a single opening about the heel in place of the two separate openings for receiving a single outrigger that spans the width of the heel.

The web-like surface 32 that extends between and around the
10 openings forms an attachment surface to which a bottom side of the outsole is attached. As described further below, the outsole is attached to the upper by means of either an adhesive and/or stitching.

Referring now to FIGS. 3A-3B two additional upper pieces are shown; a vamp 40 and a collar piece 50, respectively. The vamp 40 is one
15 of two such pieces that are attached on opposite sides of piece 20, as is known in the art. The collar piece 50 is one of two such pieces that are used to construct a collar around a top opening in the shoe upper when piece 20 is assembled. Each of the two pieces is attached along a respective side of the opening and joined together at a distal end by
20 stitching. The collar piece, in the preferred embodiment, is made of a light-weight textile shell filled with a foam insert to provide some padding between the user's ankle and the shoe upper. A plurality of eyelets 54 are formed along a front side of the piece, which receive a shoelace. The
25 eyelets provide one of a number of possibilities for synching or tightening the shoe to conform to the user's foot. Alternatively, a strap with hook and eye material (e.g., Velcro®) can be attached to one of the collar pieces and a bar mounted on the opposite piece juxtaposed to the strap to receive the same, as is known in the art. The invention is not limited to any one particular synching means and, in fact, no synching means is required as
30 in, for example, a slip-on shoe according to the invention.

A tongue piece 56 is shown in FIG. 4 which is attached to the shoe upper proximate the toe and extending between the two collar pieces and beyond so as to provide the user with access to the tongue. Tongue 56 is attached in a conventional manner to the upper with stitching, as is known in the art. In the preferred embodiment, the tongue 56 is comprised of the same material as the collar pieces, i.e., foam-filled, but is not limited thereto. The description above of the upper assembly is given by way of illustration rather than limitation. There are numerous other techniques that may be used to construct an upper for use in the shoe according to the invention based on the teachings found herein.

The assembled shoe upper is shown in FIG. 5 generally at 16. The upper 16 is in the general shape of a foot and includes a foot-shaped interior cavity for receiving the foot. The precise shape of the upper is a result of both the patterns used to form the upper pieces as well as the last used to assemble the upper. To provide maximum fit and comfort, a last that most closely approximates the anatomical shape of a foot is desired. In particular, the last should have contoured lateral and medial edges with a predetermined radius of curvature, as determined by the particular shoe size. The last should also have the natural arcuate, inward curvature from heel to toe as does the anatomical foot.

Referring now to FIGS. 6-18, the sole assembly of the shoe will now be described. The sole in FIGS. 6-18 is comprised of the outsole 14, the midsole 12, and the toe piece 18. As will be described further below, these three pieces are not constructed as a single assembly in the preferred method of construction. The relationship between the three pieces is best illustrated by the assembly drawings shown in FIGS. 6-18.

Referring now to FIG. 6, a bottom plan view of the sole is shown. This view reveals a bottom side of the outsole as well as a bottom side of the toe piece 18. The outsole includes five protrusions or "outriggers". These so-called outriggers provide lateral support to the user's foot. The

outriggers are generally concave and extend out along the sides of the outline of the foot up along the side of the shoe to provide a more rounded edge to the shoe in strategic locations. The two medial side outriggers 58 and 60 are disposed along a medial side of the shoe as defined with respect to a longitudinal axis running generally . The remaining outriggers 62, 64 and 66 are disposed on the lateral side of the shoe. The lateral side outriggers are also concave, but have a more spherical shape, with the exception of outrigger 66 which is more elongate because of the lateral to heel transition. Outrigger 58 provides support for and generally underlies the first and partially the second metatarsal heads (i.e., Metatarsal-Phalangeal Joints) along the medial side of the foot while outrigger 62 provides support for the third, fourth and fifth metatarsal heads along the lateral side thereof. Outrigger 64 generally supports and underlies the base of the fifth metatarsal along the lateral side of the shoe. The outriggers 60 and 66 are disposed on medial and lateral sides, respectively, of the calcaneus bone and provide support for the heel. Outriggers 58 and 60 terminate at one end in the arch area of the foot so as to allow the shoe to naturally flex about that area.

The surface area 68 between the outriggers is the surface to which the upper is attached by means of adhesive and/or stitching. The surface extends up and around the outriggers to form flanges such as flange 70 (FIG. 8) around outrigger 58 to facilitate attaching the outsole to the upper.

The outsole 12 is made in the preferred embodiment using an injection molded process as is known in the art. However, a compression molding process can also be used. A mold breakline is shown in FIG. 6 running longitudinally along the attachment surface 68 of the outsole. In the preferred embodiment, the outsole 12 is formed from two separate pieces that are joined together along the mold break line. The two outsole pieces can be made to overlap along the mold breakline using a lap joint

(not shown), as in the preferred embodiment, a tongue-and-groove joint, or an abutting joint to strengthen the outsole along this joint.

As can be seen in the sectional views (FIGS. 12-18), the outsole has a generally constant thickness of approximately 3-4½ millimeters. A plurality of channels (such as channel 73 on outrigger 60) are formed in the outsole to form the surface ornamentation of the outsole. In these channels, the thickness of the outsole is on the order of 1.5 millimeters. The invention is not limited to any one particular surface ornamentation. The generally constant thickness of the outsole is achieved by hollowing out or forming recesses within the outriggers that follow generally the shape of the outriggers. This is seen most clearly in sectional views 14 and 15 (and shown in phantom in FIG. 9). This hollowing out of the outsole reduces the weight and increases the flexibility of the outsole. The recesses can readily be manufactured by the use of a mold rather than having to actually remove any material from the outriggers, as described above.

The midsole 12 is seen mostly clearly in the cross sectional views shown in FIGS. 12-18. As shown therein, the midsole includes a plurality of protrusions on the bottom side thereof that extend up along the lateral and medial sides of the midsole. These protrusions occupy the recesses formed in the outsole so that the two can be placed in an abutting relationship. For example, as shown in FIG. 14, a midsole protrusion 74 occupies the corresponding recess in outrigger 62. Similarly, protrusions 76 and 78 occupy recesses in outrigger 64 and 66, respectively. The lateral protrusions 74, 76 and 78 can most clearly be seen in the oblique perspective view of the midsole 12 in FIG. 19.

The method of constructing the shoe according to the invention will now be described with reference to FIGS. 20-26. The first step is to assemble the upper from the pieces shown and described above. One of ordinary skill in the art can readily assemble the upper shown in FIG. 20

based on the drawings and descriptions of the individual pieces shown and described herein. Accordingly, this step is not further described.

Once the upper has been assembled, the outsole 14 is inserted into the foot-shaped interior cavity of the shoe upper as indicated by the arrow in FIG. 20. The outsole is inserted into the cavity so that the outriggers are inserted into and protrude out of the corresponding openings in the upper 16. The outsole is then attached to the upper by a stitch 80 that weaves around the outer perimeter of the openings thereby connecting the upper 16 to the outsole flanges (e.g., flange 70 in FIG. 8) and the attachment surface 68 (in FIG. 6) of the outsole. In addition, an adhesive can be applied to the attachment surface and/or the interior receiving surface of the upper before the outsole is inserted into the upper to provide an additional bond between the upper and the outsole.

Once the outsole is attached, the midsole is then inserted into the interior cavity of the upper and affixed to the top side of the outsole as shown in FIG. 22. An adhesive can be used on the bottom side of the midsole 12 to secure the midsole to the outsole. As shown and described above, the midsole 12 is placed in an abutting relationship with the outsole so that the midsole protrusions (e.g., 74-78) occupy the recesses in the outsole. A last 82 is then inserted into the interior cavity of the upper in order to apply pressure to the midsole to strengthen the bond between the midsole and the outsole as shown in FIGS. 23-24. The last is designed after an anatomical foot. As such it has an arcuate inward bend along its longitudinal axis so that the big toe is inset relative to the heel, as in an anatomical foot. Moreover, unlike conventional lasts, last 82 has rounded edges along the base of the last. These rounded edges allow the upper to conform more naturally to the foot, instead of encountering the hard, perpendicular edges of a conventional shoe. These rounded edges are carried through to the heel, which also have contoured edges.

In the final step, the toe piece 18 is attached to a toe portion of the upper shown generally at 34. The piece 18 is attached by means of an adhesive. Alternatively, stitching can be used in addition to or in place of the adhesive. The adhesive is then allowed to dry and the shoe construction is complete.

The description of the method of construction and the resulting shoe described above is meant to illustrate and not to limit the scope of the invention. There are many variations of the invention that fall within the ambit of the Applicant's invention. In particular, the number, location and/or shape of the openings and corresponding outsole protrusions is not limited to those described above. One alternative embodiment mentioned above uses a single outrigger for the heel rather than the two separate ones (60 and 66) described above. In addition, an outrigger can be added to the toe of the outsole, which is received in the corresponding opening in the upper, instead of using a separate toe piece attached to the upper. Moreover, the steps described above need not be performed in the precise order that they are described. For example, the midsole can be attached to the outsole and the combined assembly inserted into the interior cavity of the upper. Further, the outsole is not limited to the design and construction described above. The midsole material can be replaced by air, or other gas, or visco-elastic material to provide the required cushioning.

Having described and illustrated the principles of the invention in a preferred embodiment thereof, it should be apparent that the invention can be modified in arrangement and detail without departing from such principles. The shoe described herein is that for a right foot it being understood that the left foot shoe is the mirror image thereof. I claim all modifications and variation coming within the spirit and scope of the following claims.

CLAIMS

1. A method of constructing a shoe:

forming a foot-receiving shoe upper having a bottom side, a medial
5 side, a lateral side, the bottom side including at least one opening, the
shoe upper having an interior cavity defined by the bottom side, the
medial side and the lateral side;

forming a shoe outsole having an inner surface and an outer surface,
the outer surface conformed to the interior cavity of the shoe upper, the
10 outsole having a protrusion on the outer surface at a location
corresponding to the opening in the shoe upper so that the protrusion
extends through the opening when the outsole is inserted in the shoe
upper;

inserting the outsole into the interior cavity of the upper so that the
15 outer surface of the of outsole abuts the interior cavity and the protrusion
extends through the opening; and

securing the outsole to the upper.

2. A method of constructing a shoe according to claim 1 wherein
20 the step of forming a shoe upper includes forming a shoe upper having a
plurality of openings in the bottom side for receiving a corresponding
plurality of protrusions on the shoe outsole.

3. A method of constructing a shoe according to claim 2 wherein
25 the step of forming a shoe outsole includes forming a shoe outsole having
a plurality of protrusions on the outer surface, each protrusion located on
the outer surface at a location corresponding to an opening in the shoe
upper so that the protrusion extends through the corresponding opening
when the outsole is inserted in the shoe upper.

4. A method of constructing a shoe according to claim 3 wherein the step of forming a shoe outsole having a plurality of protrusions on the outer surface includes:

forming a first protrusion underlying a forefoot portion of the outsole; and

forming a second protrusion underlying a heel portion of the outsole.

5. A method of constructing a shoe according to claim 3 wherein the step of forming a shoe outsole having a plurality of protrusions on the outer surface includes:

forming a first metatarsal head protrusion underlying the metatarsal heads of the foot along a lateral side of the outsole; and

forming a second metatarsal head protrusion underlying the metatarsal heads of the foot along a medial side of the outsole.

6. A method of constructing a shoe according to claim 5 further comprising the step of forming a third protrusion underlying a fifth metatarsal head of the foot along a lateral side of the outsole.

7. A method of constructing a shoe according to claim 4 wherein the step of forming a first protrusion underlying a forefoot portion of the outsole includes forming a concave protrusion.

8. A method of constructing a shoe according to claim 7 wherein the step of forming a concave protrusion includes:

forming a medial rounded edge on the first protrusion;

extending the medial rounded edge up along one side of the upper.

9. A method of constructing a shoe according to claim 3 wherein the step of forming a shoe outsole having a plurality of protrusions on the

outer surface includes:

forming a first heel protrusion underlying a calcaneus bone of the foot along a medial side of the outsole; and

5 forming a second heel protrusion underlying a calcaneus bone of the foot along a lateral side of the outsole.

10 10. A method of constructing a shoe according to claim 1 wherein the step of forming a shoe outsole includes the step of forming a recess in the shoe outsole defined by the inner surface.

11. A method of constructing a shoe according to claim 10 further comprising the steps:

forming a midsole having an inner surface and an outer surface, the outer surface being conformed to the inner surface of the outsole; and

15 inserting the midsole into the interior cavity of the upper so that the outer surface of the midsole abuts the inner surface of the outsole.

12. A method of constructing a shoe according to claim 11 further including:

20 applying an adhesive between the outer surface of the midsole and the inner surface of the outsole;

inserting a last into the interior cavity; and

applying pressure on the last so as to secure the midsole to the outsole.

25 13. A method of constructing a shoe according to claim 1 wherein the step of forming a foot-receiving shoe upper includes forming a rounded edge along the bottom side of the upper so that the upper will more naturally conform to the shape of the foot.

14. A method of constructing a shoe according to claim 13 further including forming an arcuate inward bend in the upper along its longitudinal axis so that the upper will more naturally conform to the shape of the foot.

5

15. A method of constructing a shoe according to claim 1 wherein the step of forming a shoe upper includes the step of forming a shoe upper having a toe portion; and wherein the method further includes the steps of:

10

forming a toe piece; and

securing the toe piece to the toe portion of the shoe upper.

15

16. A method of constructing a shoe according to claim 15 wherein the step of forming a shoe outsole includes the step of forming a flange around a portion of the protrusion so that the stitching passes through the flange.

20

17. A shoe comprising:

a shoe outsole having an inner surface and an outer surface, the outsole having a plurality of protrusions mounted on the outer surface; and

25

a shoe upper having a bottom side having a plurality of openings, a medial side, and a lateral side, the bottom side, the lateral side and the medial side forming an interior cavity for receiving a foot, the outsole placed in abutting relationship with the bottom side of the shoe upper such that the protrusions extend through the openings in the shoe upper.

30

18. A shoe according to claim 17 wherein a portion of the outer surface not occupied by the protrusions comprises an attachment surface and wherein the attachment surface of the outsole is in abutting

relationship with the bottom side of the shoe upper.

19. A shoe according to claim 18 further comprising a means for attaching the shoe upper to the shoe outsole.

5

20. A shoe according to claim 17 wherein the shoe outsole includes a plurality of recesses formed on the inner surface, each recess formed above a corresponding protrusion.

10

21. A shoe according to claim 20 further comprising a midsole having an inner surface and an outer surface, the outer surface of the midsole being conformed to the inner surface of the outsole and having a plurality of midsole protrusions, the outer surface of the midsole placed in abutting relationship with the inner surface of the sole wherein each midsole protrusion is received in a corresponding recess in the outsole.

15

22. A shoe according to claim 17 wherein the shoe upper includes a toe portion and wherein the shoe further includes a toe piece attached to the toe portion.

20

23. A shoe according to claim 17 wherein said outsole further comprises:

a forefoot protrusion underlying a forefoot portion of the outsole;
and

25

a heel protrusion underlying a heel portion of the outsole.

24. A shoe according to claim 17 wherein said outsole includes:
a first metatarsal head protrusion underlying the metatarsal heads of the foot along a lateral side of the outsole;

30

a second metatarsal head protrusion underlying the metatarsal

heads of the foot along a medial side of the outsole;

a first heel protrusion underlying a calcaneus bone of the foot along a medial side of the outsole;

a second heel protrusion underlying a calcaneus bone of the foot
s along a lateral side of the outsole; and

a third metatarsal head protrusion underlying a fifth metatarsal head of the foot along a lateral side of the outsole.

25. A shoe according to claim 24 wherein said first metatarsal
10 head protrusion includes an outer rounded edge that extends up along the lateral side of the upper.

26. A shoe according to claim 24 wherein said second metatarsal
15 head protrusion includes an outer rounded edge that extends up along the medial side of the upper.

27. An upper for receiving a foot comprising:
a bottom piece shaped to wrap around the foot, the bottom piece having a bottom side, a medial side, and a lateral side, the bottom piece
20 having a plurality of holes formed on the bottom side;
a medial side piece attached to the medial side of the bottom piece;
and
a lateral side piece attached to the lateral side of the bottom piece.

28. An upper according to claim 27 wherein the bottom piece
25 includes:

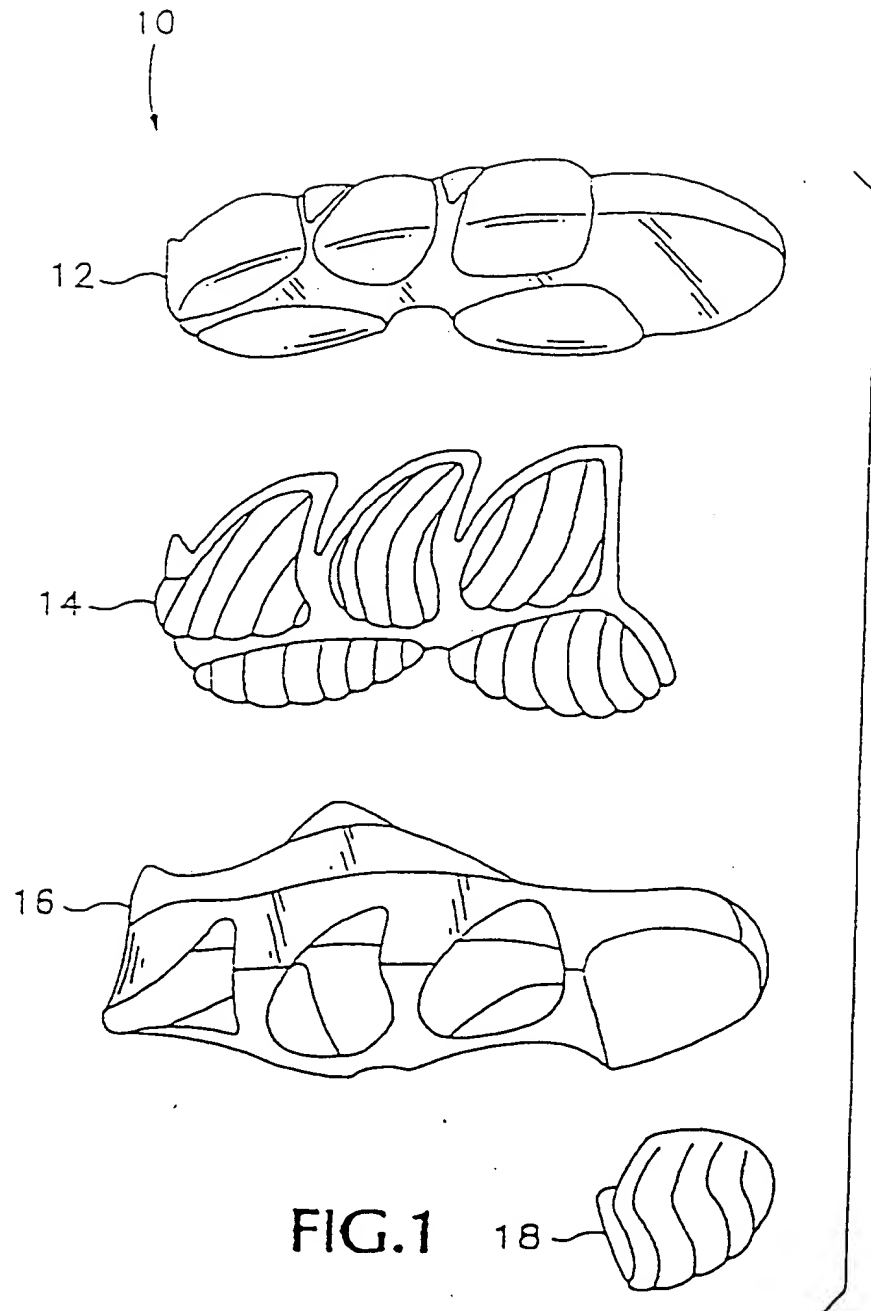
a forefoot hole underlying a forefoot portion of the outsole for receiving a forefoot protrusion; and

a heel hole underlying a heel portion of the outsole for receiving a
30 heel protrusion.

29. An upper according to claim 28 wherein the bottom piece includes:

- 5 a first metatarsal head hole underlying the metatarsal heads of the foot along the lateral side of the bottom piece;
- a second metatarsal head hole underlying the metatarsal heads of the foot along a medial side of the bottom piece;
- a first heel hole underlying a calcaneus bone of the foot along a medial side of the bottom piece;
- 10 a second heel hole underlying a calcaneus bone of the foot along a lateral side of the bottom piece; and
- a fifth metatarsal head hole underlying a fifth metatarsal head of the foot along a lateral side of the bottom piece.

15 30. An upper according to claim 27 further comprising a tongue piece attached to the bottom piece on along a top, front portion of the bottom piece.



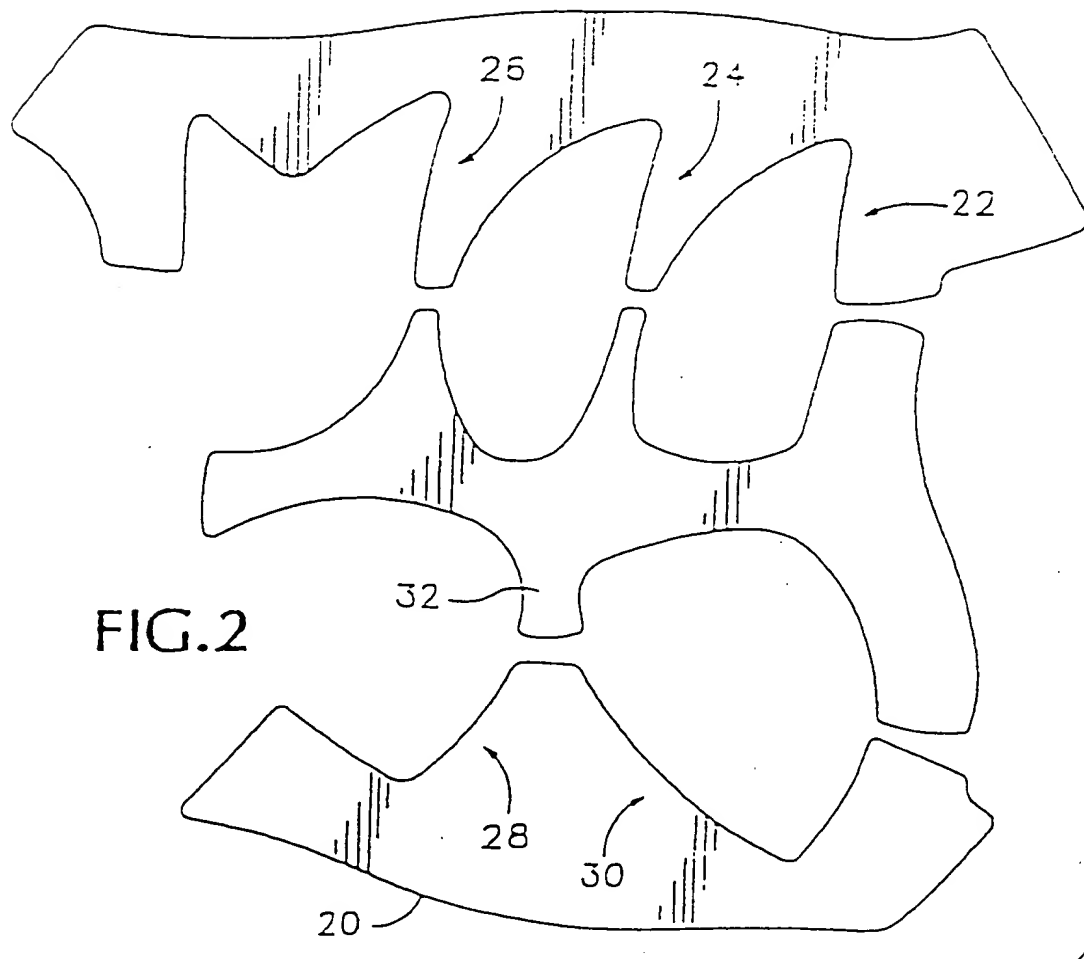


FIG. 2

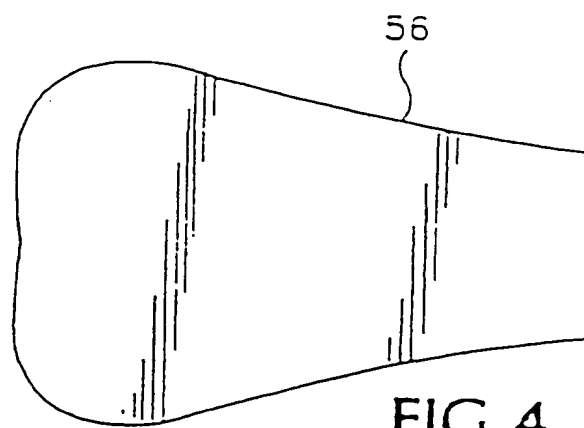


FIG. 4

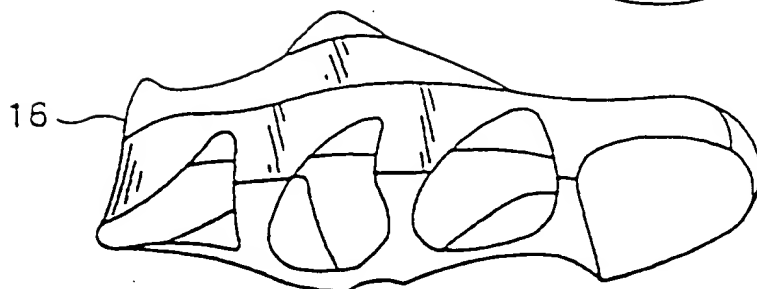
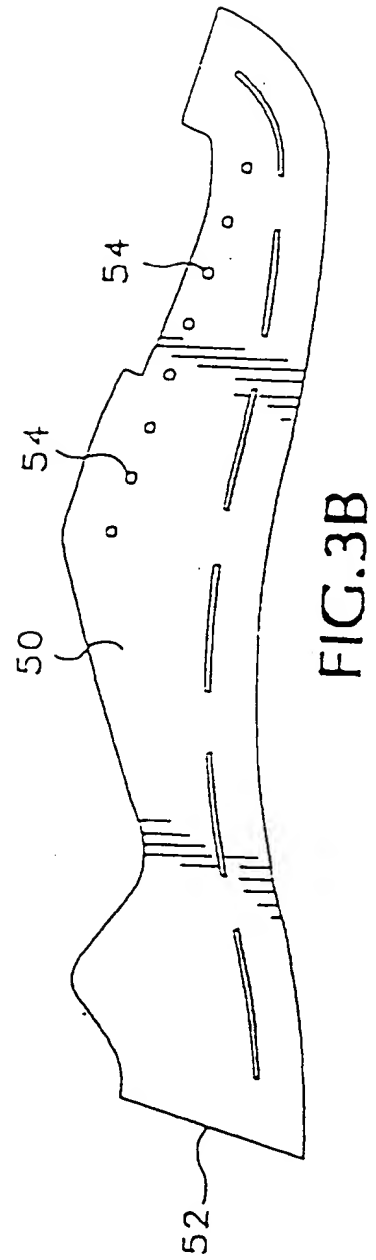
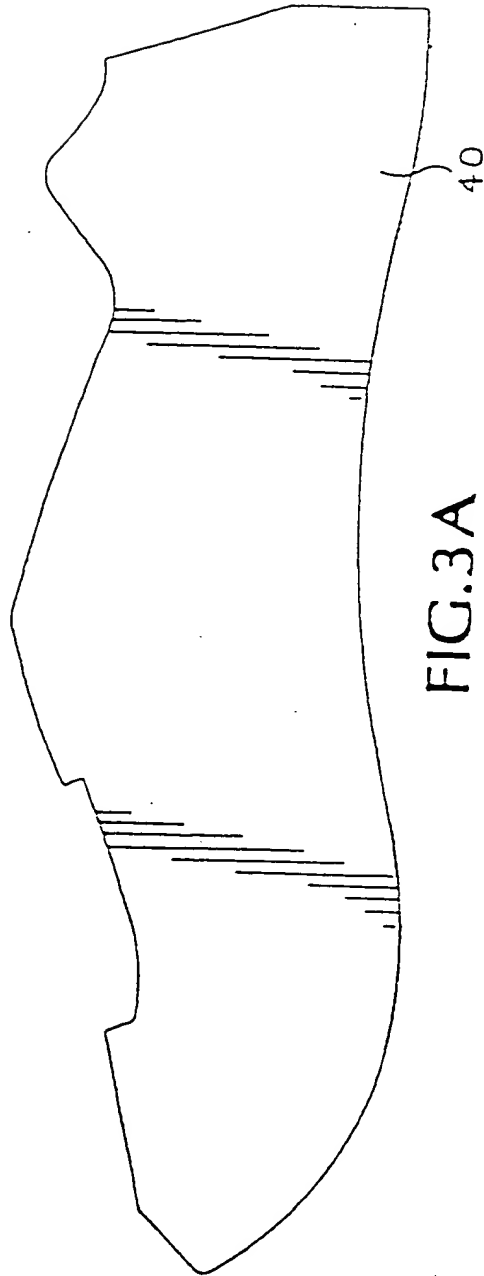


FIG. 5



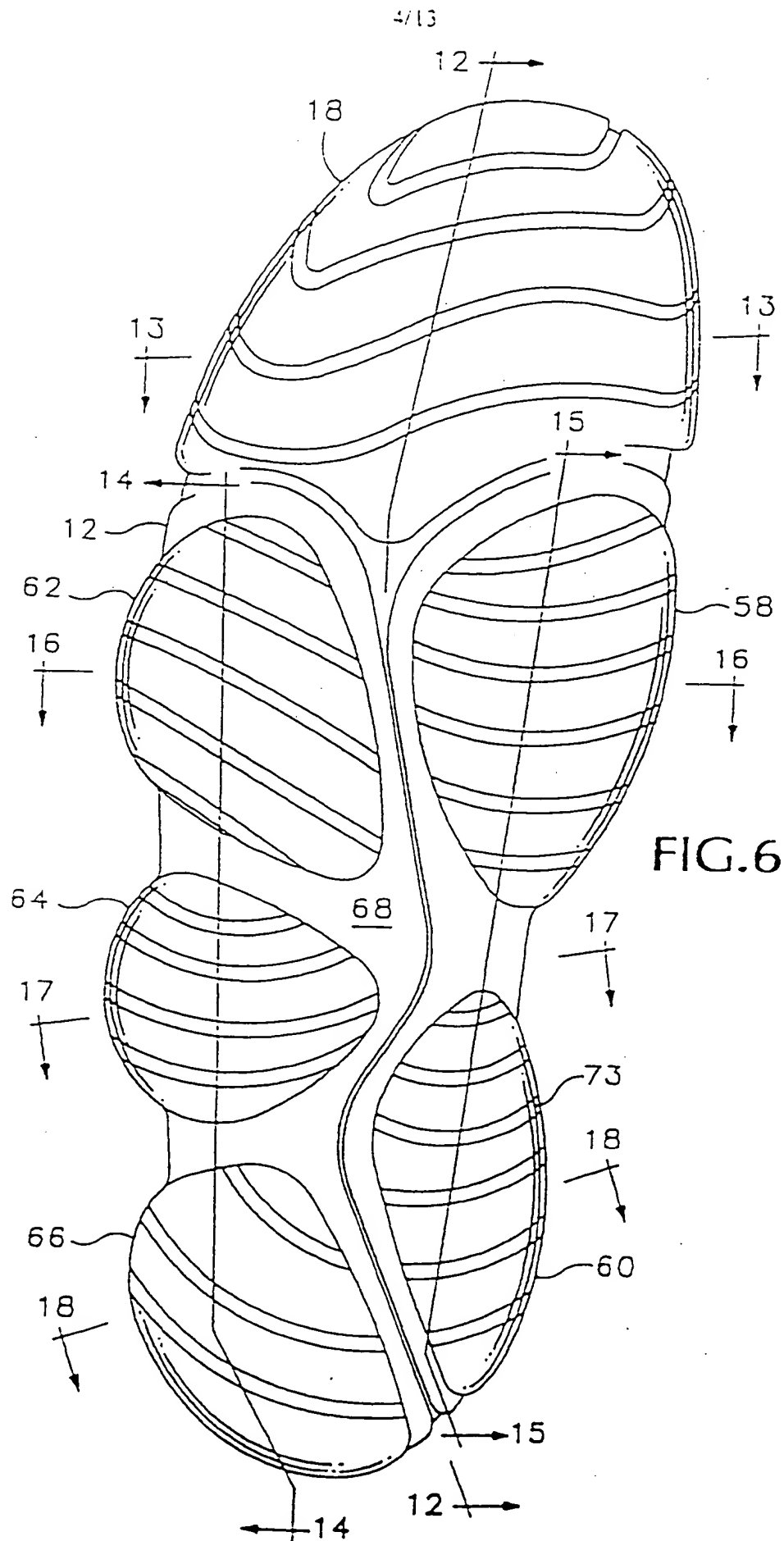


FIG. 6

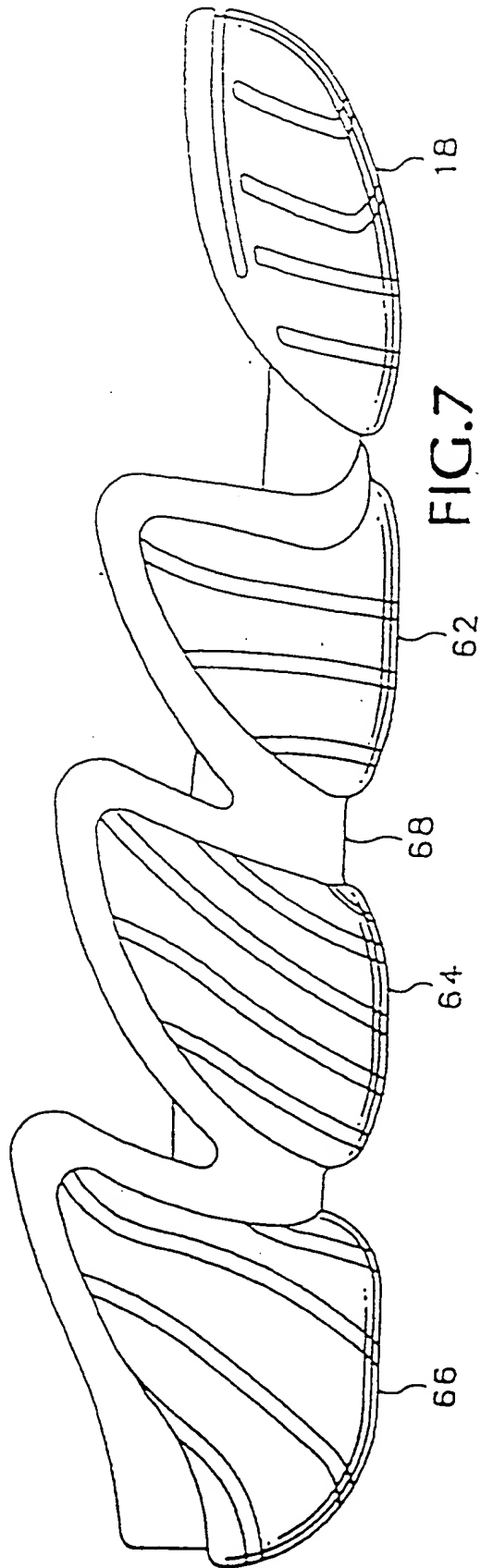


FIG. 7

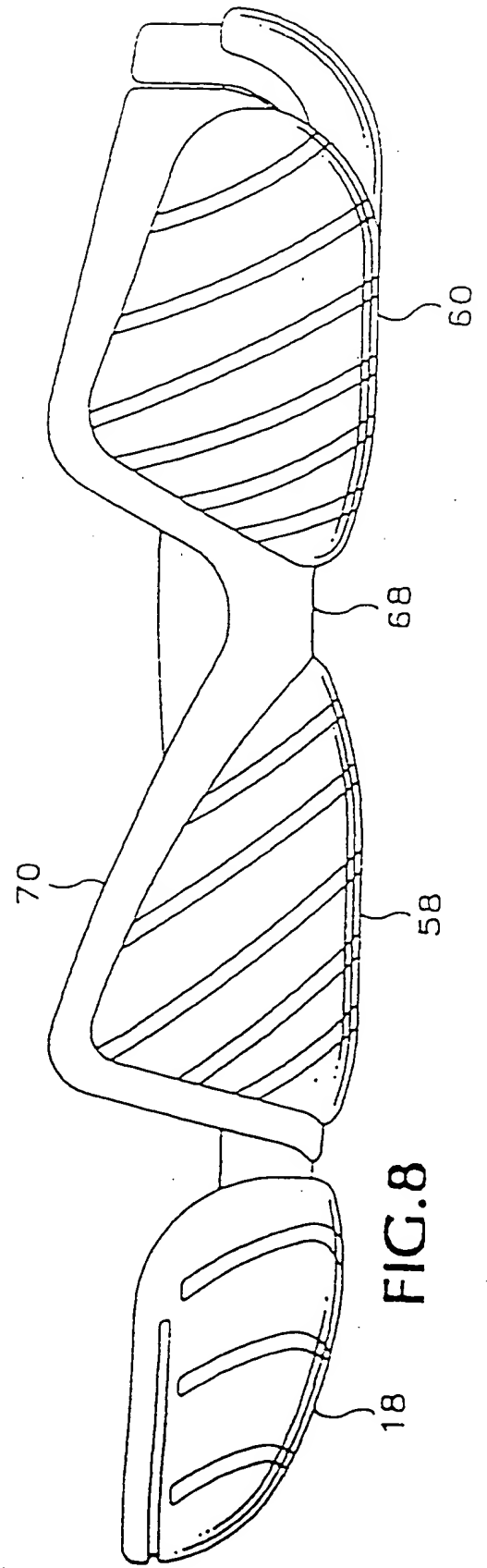
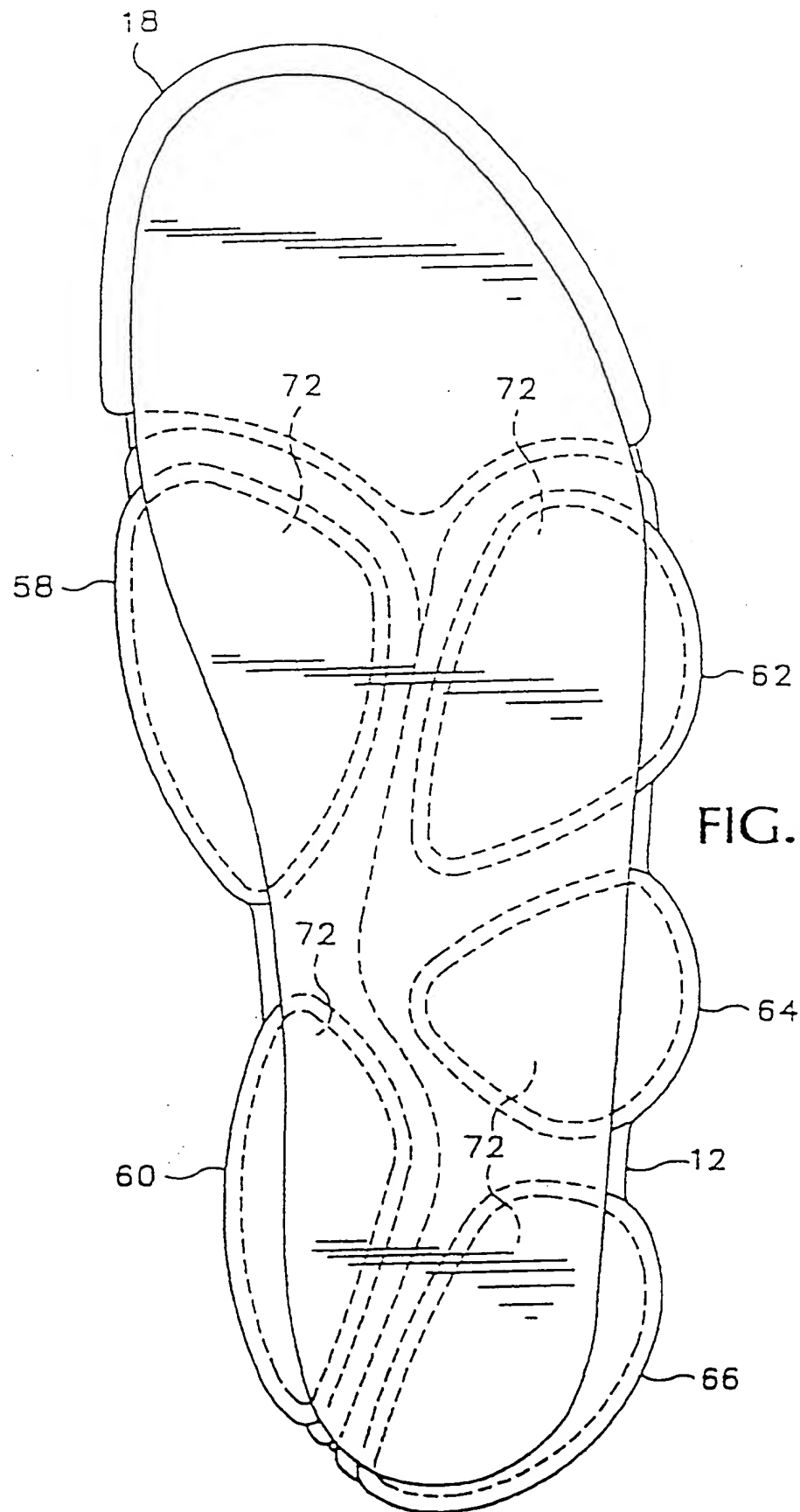


FIG. 8



7/13

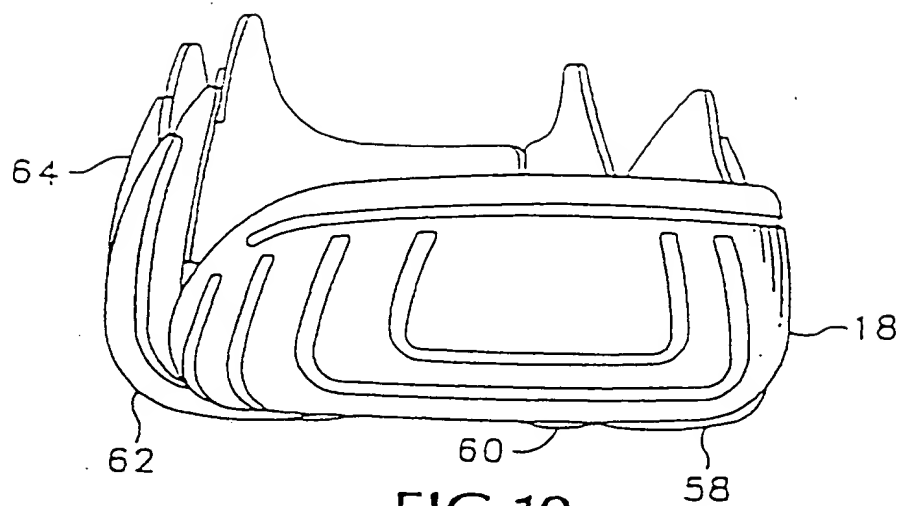


FIG. 10

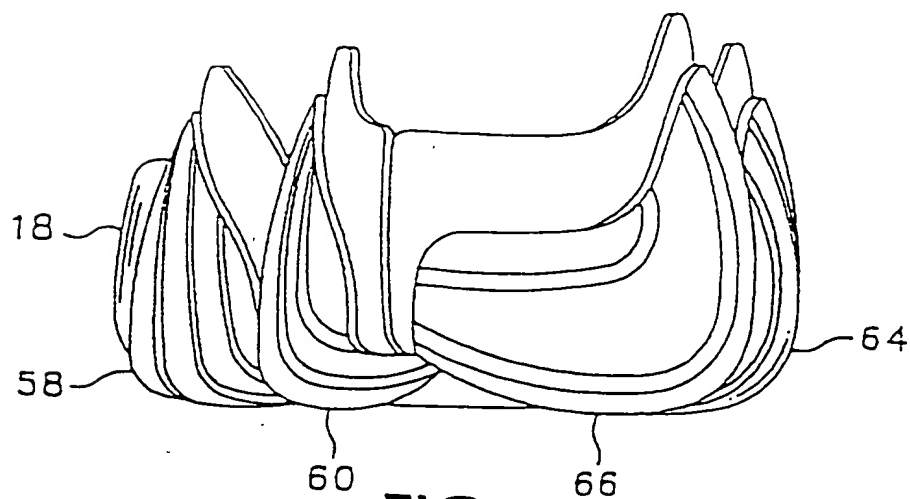
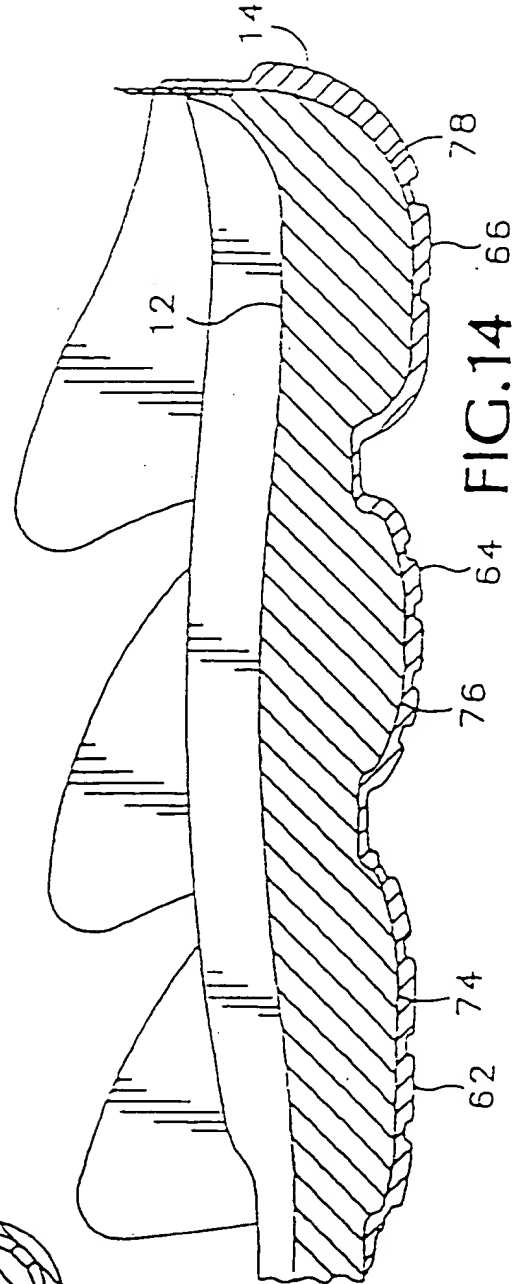
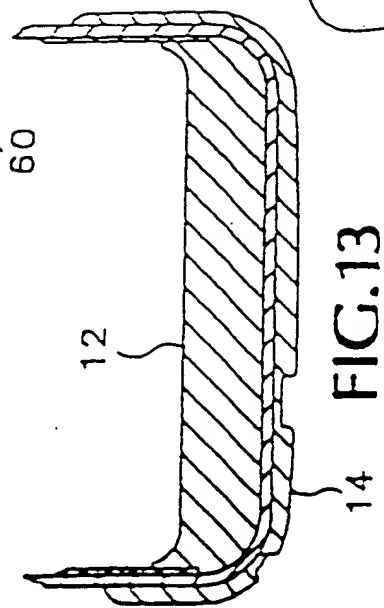
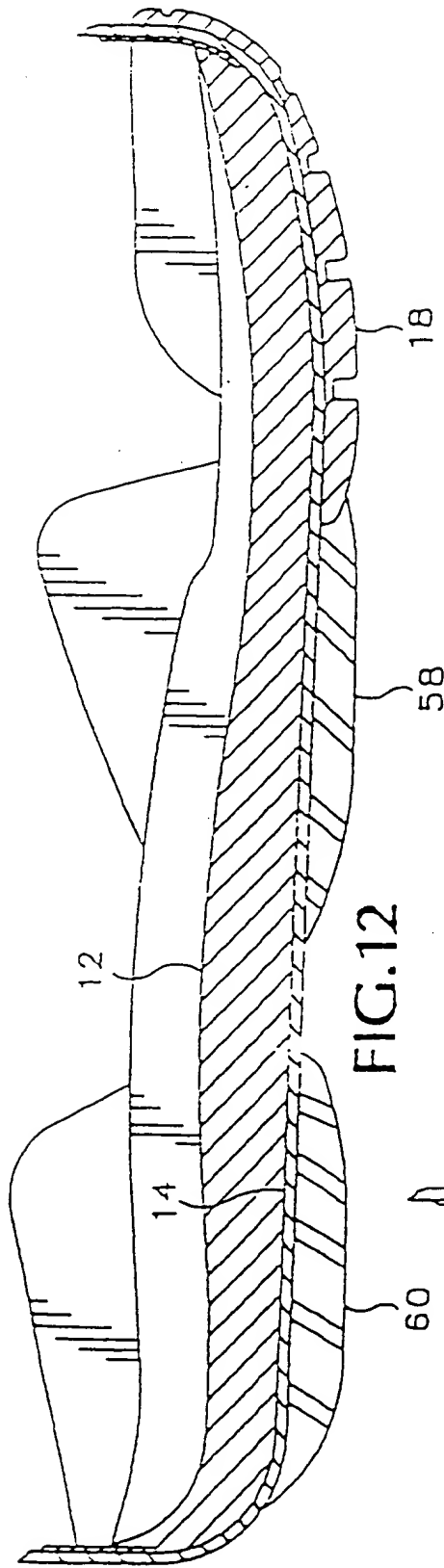
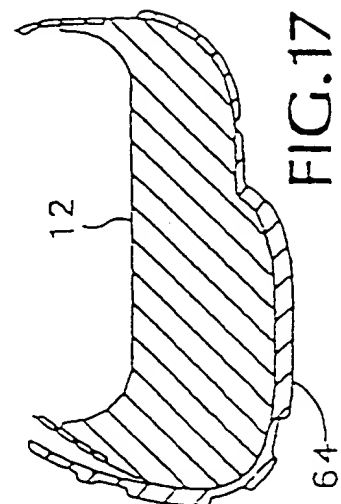
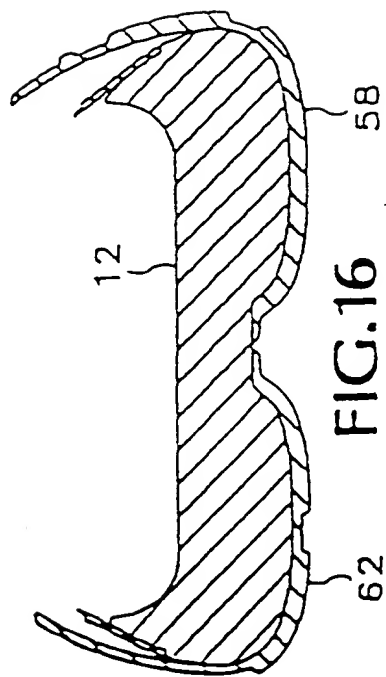
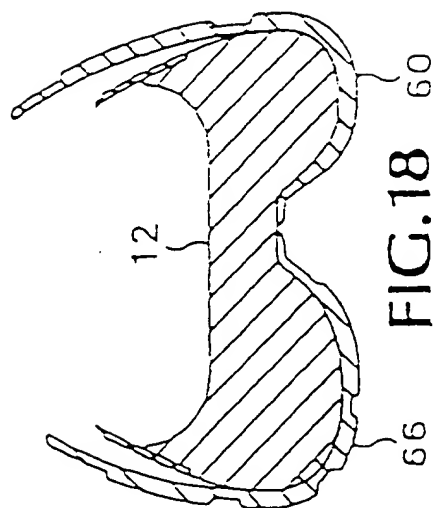
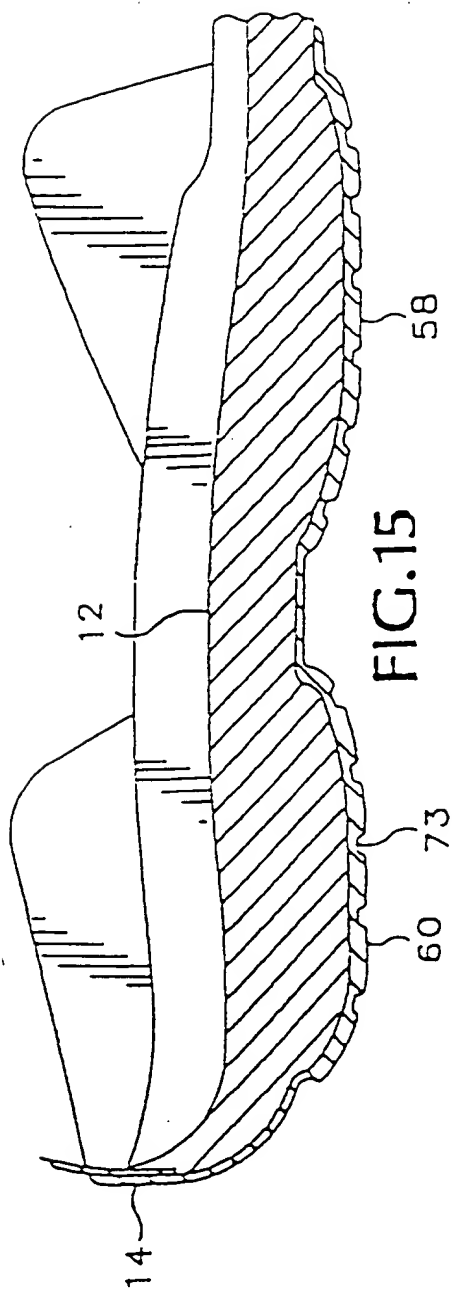


FIG. 11

8/13



9/13



10/13

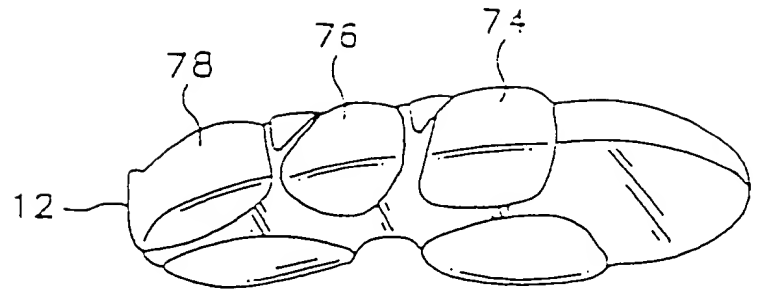


FIG. 19

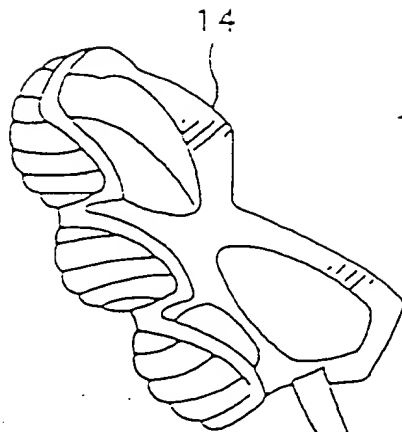


FIG. 20

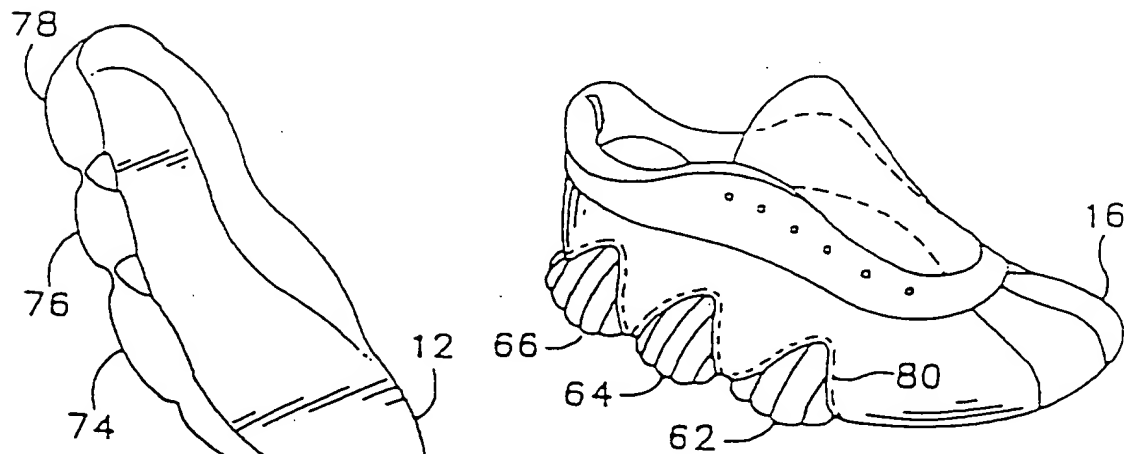
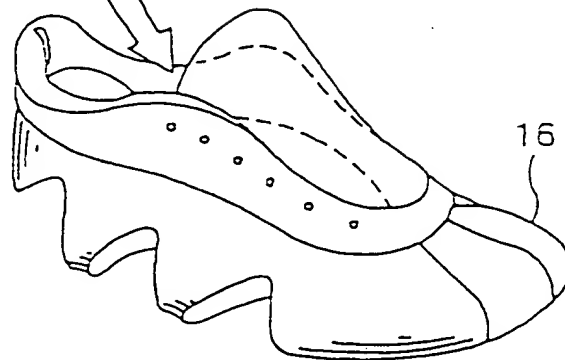
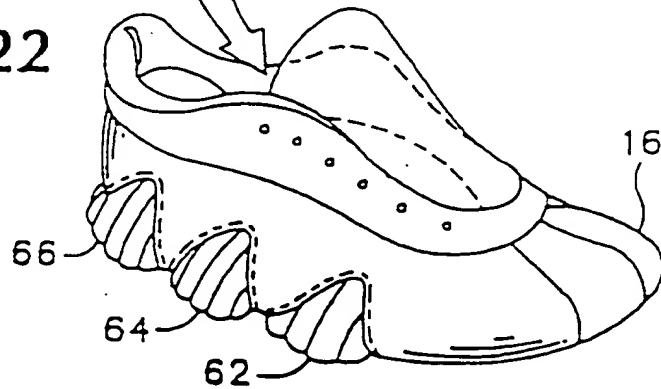


FIG. 21

FIG. 22



11/13

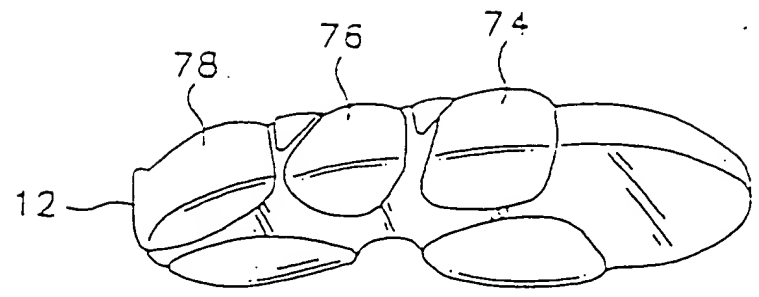


FIG. 19

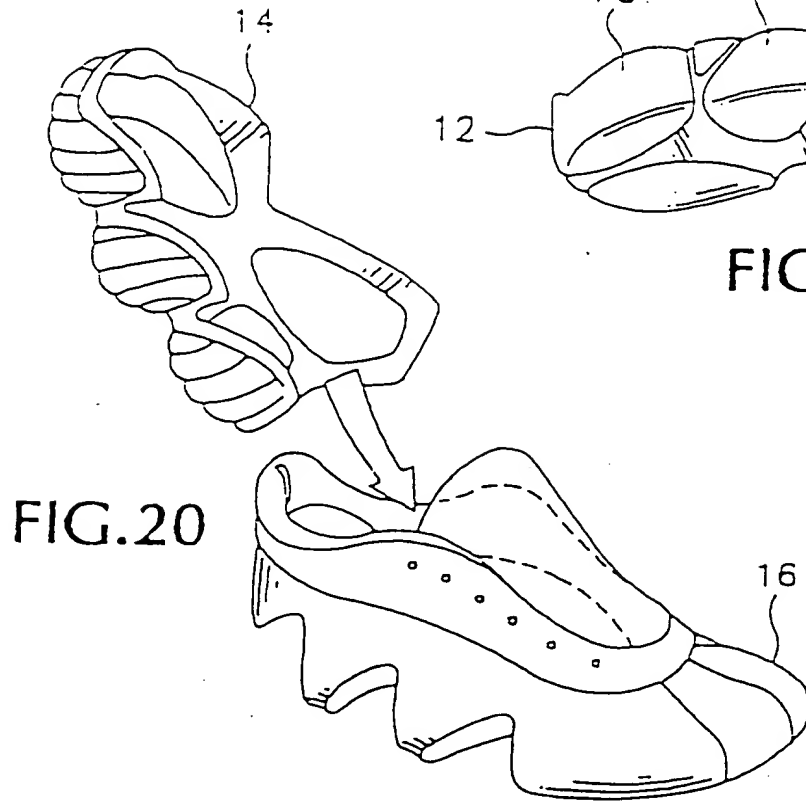


FIG. 20

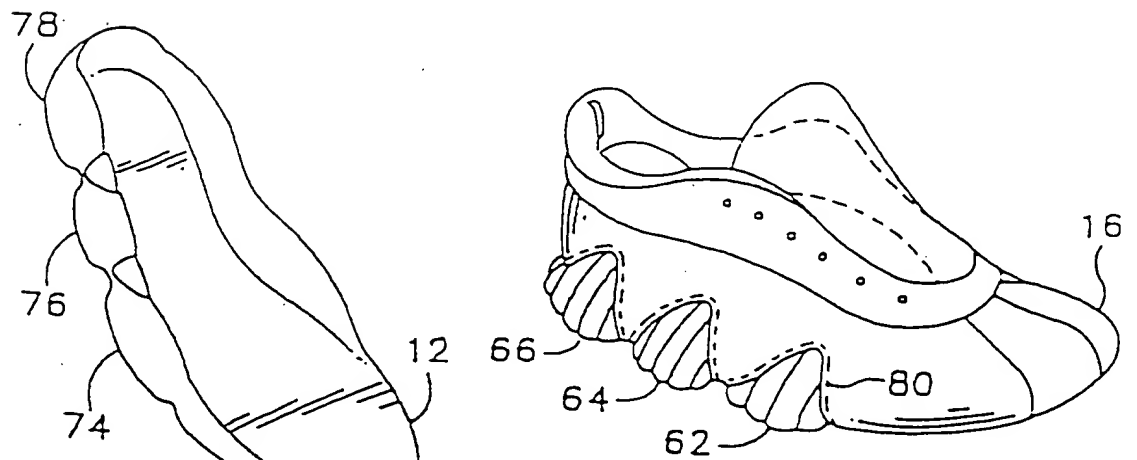
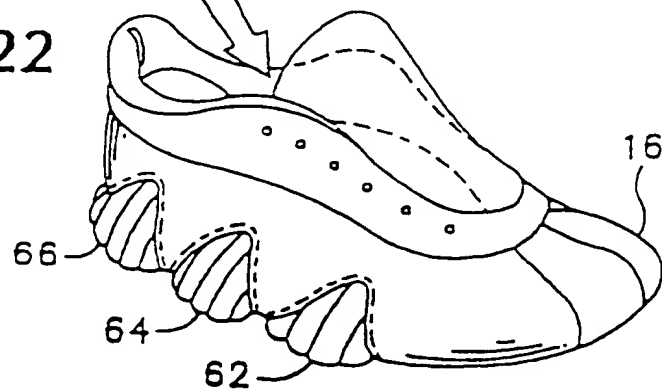
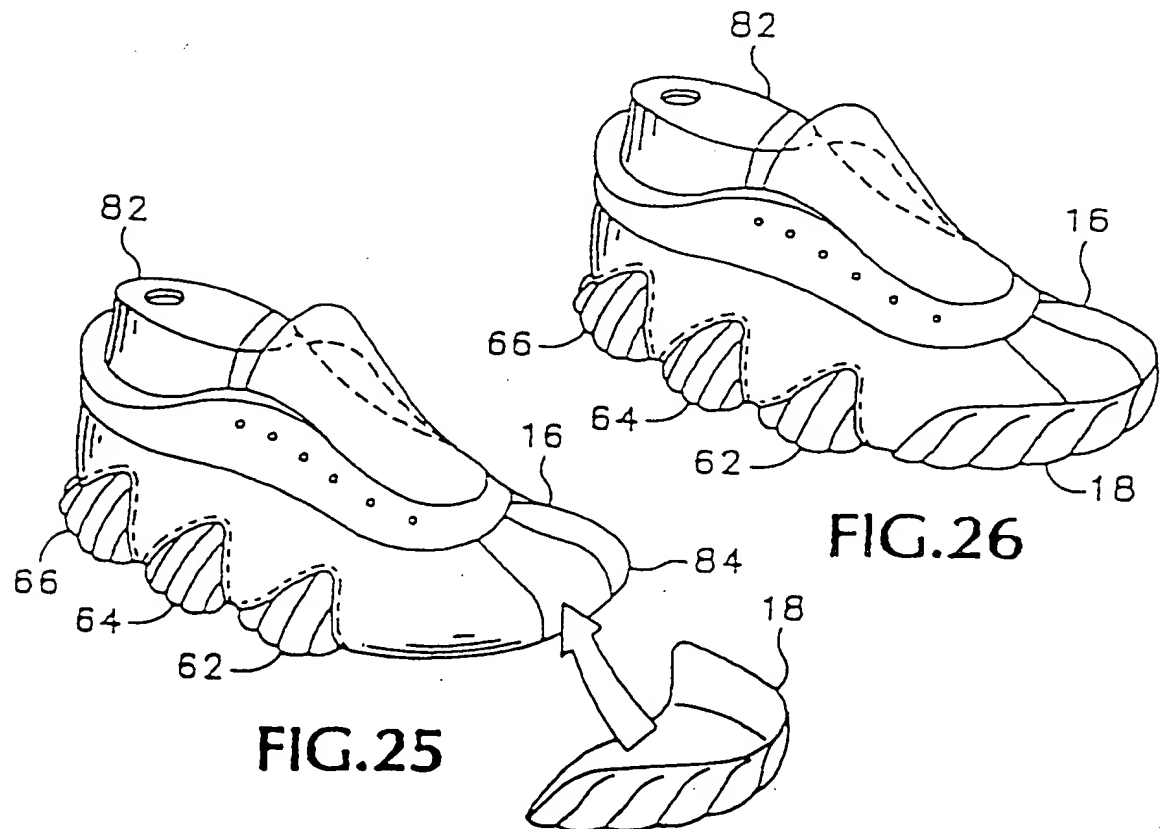
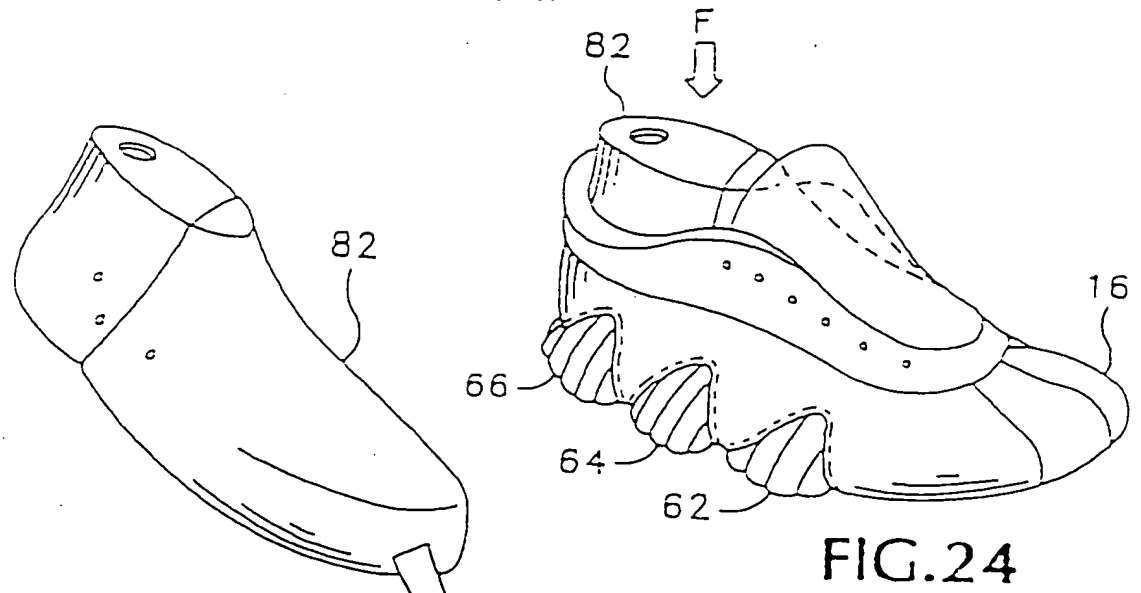


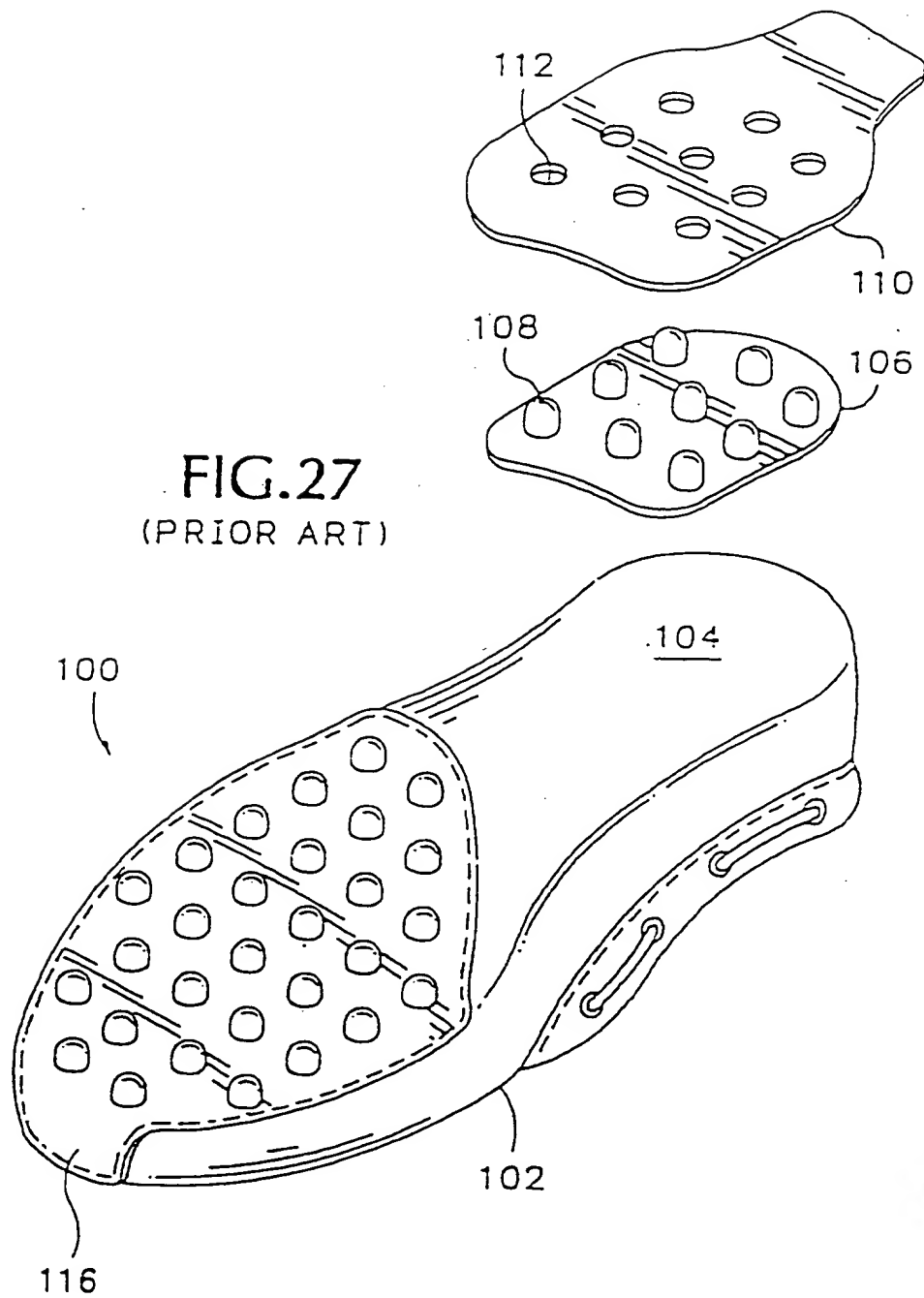
FIG. 21

FIG. 22



12/13





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A	US 4 481 727 A (STUBBLEFIELD JERRY D) 13 November 1984 see the whole document ---	1-30
A	FR 2 581 517 A (MARTEL RENE) 14 November 1986 see the whole document ---	17-26
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A	---	28
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